

CHAPTER VII: CIVIL WAR ENGINEERING AND NAVIGATION

The Corps of Engineers devoted its primary attention to the performance of its military mission from 1861 to 1865. It was a multifaceted mission, consisting of the planning, tracing, and construction of fortifications, topographic reconnaissance — Civil War battles were often won by those who possessed the best maps — and temporary pontoon bridge and road and railroad construction to facilitate movement of the armies. Union Army Engineers fortified Louisville, Cincinnati, Paducah, Smithland, Cairo, and a number of other port cities in the Lower Ohio Valley; constructed defenses for such inland cities as Frankfort, Bowling Green, and Lexington; built hundreds of feet of temporary pontoon bridging at the Engineer depot at Cincinnati; put down pontoon bridges across rivers — the longest floating bridge ever constructed was completed at Paducah in 1861 — and in general provided full military construction and logistic support for the defense of the Lower Ohio Valley.

Improvement of waterways navigation was neglected in the face of more urgent military functions during the course of the war, but the volume of waterborne commerce on the Ohio River and its tributaries rose to new heights as troops and supplies flowed steadily to the combat theaters. The increased commercial use of the Ohio during the war led, in 1866, to recognition of the need of the Ohio and other inland rivers for further improvement of navigation. The Civil War was for federal waterways policies, as it was for many other aspects of American life, a pivotal event. Before the war the sectional and political divisions of the nation precluded an effective, systematic program of waterways navigation improvement; afterwards, the

constitutionality of federally funded and directed waterways projects was no longer seriously questioned.

Control of the Waterways, 1861

The southwesterly course of the Ohio River formed a tangible extension of the Mason-Dixon line dividing North from South, but the Ohio River and its tributaries also bound the region together as an entity distinctly separate from both North and South. Though the states bordering the Ohio retained their political attachment to the Union during the war, the people of the Ohio Valley, tied commercially to the South by the waterways, were terribly divided at the outbreak of war. West Virginia was still part of the Old Dominion; Kentucky was counted as a Southern state; and many citizens of southern Ohio, Indiana, and Illinois had Southern sympathies. The fact that Kentucky was the birthplace of both Abraham Lincoln and Jefferson Davis provides ample evidence of the reason sentiment in the Bluegrass State was so divided.

Louisville, controlling the Ohio River at the canal and the northern terminus of the Louisville and Nashville Railroad, was a particularly strategic city. Control of Louisville also meant control of most of Kentucky; and had the Confederacy secured Louisville and the state, making the Ohio River its northern boundary, the war could have had an entirely different course, for at the time there are no bridges across the river below Wheeling. Cincinnati, the growing industrial city on the northern bank of the river, was the largest city in the Midwest in 1861, but utilization of its industrial production capability still was dependent on control of the river at that date because it had no rail outlets

south.¹

Thus control of the southern bank of the Ohio and mastery of Ohio Valley waterways were questions of considerable interest, both to the citizens of the Ohio Valley and the opposing governments. Both governments respected the proclaimed neutrality of Kentucky for a time and both hesitated before sealing off the principal trade route, the Mississippi River, between the Ohio Valley and the South. Trade down the Mississippi, though hampered by inspections and some confiscations of cargos, continued until after hostilities had begun.²

At the onset of war, Colonel Stephen H. Long was Chief Engineer of the Topographical Bureau; he was the last to serve in that capacity, for the Corps of Topographical Engineers was amalgamated with the Corps of Engineers in 1863. (Colonel Long retired and General Richard Delafield became Chief of Engineers.) To facilitate planning and construction of gunboats on the Ohio and western rivers, Colonel Long reported in 1861 on available navigable depths. He said that for *six* months of the year only, a six-foot navigable depth was available on the Lower Ohio up to Louisville; five-foot from Louisville to Wheeling; and four-foot from Wheeling to Pittsburgh, with much lesser depths available on tributary streams. He therefore recommended that the draft of vessels "designed for service in the prosecution of the unhappy civil war with which our once peaceful country is now afflicted" be limited to less than four feet.³

Colonel Joseph G. Totten, Chief Engineer of the Corps of Engineers, conducted a survey of the steamboats which might be available for government service as troop and supply transports, and found that about 250 were plying the Ohio River

in 1861 and an additional 150 were operating out of St. Louis on the Upper Mississippi. Many of them were purchased for government service by the Quartermaster Department; and others contracted at various times during the war to transport war materials. Though the war was marked by extensive use of railroads for military purposes — the Corps of Engineers repaired, built, and tore up hundreds of miles of track during the war — waterways, where available, became the backbone of Union logistics. And in this service many vessels were lost to enemy fire or wrecked on the unimproved rivers.⁴

In late summer, 1861, all pretense of respecting the neutrality of Kentucky and preserving free navigation down the Mississippi was ended. Confederate forces moved into Southern Kentucky and placed a chain across the Mississippi at Columbus; and Union Troops occupied Cairo and Louisville and severed legal trade with the South. During the summer and fall of 1861, several incidents involving Ohio river packets occurred which launched hostilities in the Western theater. A Union gunboat seized the steamboat *W. B. Terry* at Paducah, for instance, in August, 1861, and Confederate-sympathizers at Paducah retaliated by seizing the *Sam Orr* and steaming it up the Tennessee River to Confederate territory, where it was destroyed in 1862.⁵

By the end of 1861 all traffic south of Cairo was suspended, as Union armies prepared to strike south via the Tennessee, Cumberland, and Mississippi rivers. In preparation for this campaign Union authorities had initiated emergency measures to get the necessary floating craft assembled, somewhat on the lines advocated by Captain John Sanders in 1838. Commander John Rogers purchased three large steamboats, the *Conestoga*, the

A. O. Taylor, and the *Lexington*, and converted them into gunboats at the New Albany shipyards in 1861. Gunboat construction at Ohio River shipyards began in earnest in 1862; and by 1865 Cincinnati shipyards alone had turned out fifty-six gunboats. Captain James B. Eads constructed ironclads at St. Louis (Carondelet) shipyards and established a second construction center at Mound City, Illinois, on the Ohio just above Cairo. Colonel Charles Ellet, Jr., the prewar advocate of reservoir construction in the Ohio Valley, constructed and commanded a fleet of "suicide" rams designed to smash the hulls of Confederate boats. They proved effective in action, but Ellet died of wounds received in action at Memphis in 1862, and command of the ram fleet fell to his brother and his son, Charles Rivers Ellet. Ohio River shipyards experienced their greatest construction boom in history and even turned out ocean-going ironclad monitors late in the war.⁶

With this growing fleet, Union armies moved up the Tennessee and Cumberland rivers into the Southern heartland in early 1862 and descended the Mississippi. After a year and a half of continuous action, the Mississippi was again open to New Orleans, the steamboat *Tempest* being the first to reach the Ohio Valley from New Orleans, but waterborne commerce on the Ohio had already revived to meet the logistic needs of the Union armies. By May, 1862, the wharf at Louisville was covered with arriving and departing boats and their cargos. Contractors in Louisville furnished Union armies two hundred head of cattle daily, while Louisville slaughter houses processed a thousand hogs daily. The military supply business had similar effects on commerce at other Ohio River ports. At Evansville, Indiana, for instance, steamboat com-

merce doubled during the war to serve supply businesses which tripled their prewar volume during the conflict.⁷

Action on Ohio Valley Waterways

One objective of Confederate raids into the Ohio Valley was to harass and interrupt logistic support functions. Confederate units obstructed locks on state slack-water projects on tributary streams and often subjected steamboats to rifle and artillery fire. The raids frequently disrupted commerce on tributaries like the Green and Kentucky rivers, and at times caused suspension of traffic on the Lower Ohio. The raid of the Confederate cavalry commanded by John H. Morgan even suspended navigation between Louisville and Cincinnati for a time in 1863; and commerce on the Ohio at Paducah was disrupted in April, 1864, when cavalry commanded by General Nathan B. Forrest sought to capture the city.⁸ Navigation was more seriously hampered, however, on the tributaries which join the Ohio from the south.

Confederate forces which occupied Bowling Green, Kentucky, in 1861 sought to secure the water approach to the city via the Green and Barren rivers by obstructing the state-constructed locks. Union troops rushed up the Green River by boat from Evansville to save Locks and Dams Nos. 1 and 2 (at Spottsville and Rumsey, Kentucky), but Confederates seized Lock and Dam No. 3 (at Rochester, Kentucky). They planned to blow up Lock and Dam No. 3, and holes were drilled in the structure for that purpose, but mill owners at the dam-site asked that their livelihood be not destroyed. A regiment of Mississippi troops refused to participate in the destruction, saying it was not the "kind of warfare they came to Kentucky to wage," and Kentucky and Tennessee troops, di-

rected by W. S. Van Meter, an old Green River steamboat captain of Bowling Green, obstructed the lock with boulders instead of destroying the project. Unionists, however, used the incident as an example of Confederate atrocities. One Union congressman urged the people of the Green River valley to rise en masse against the Confederate "invaders" who destroyed the slackwater project on the Green River "paid for out of your sweat and taxes."⁹

Navigation was restored on the Green and Barren rivers after the Union occupation of Southern Kentucky in early 1862; but in September, 1862, another Confederate unit dumped rock into the lock at Spottsville, Kentucky (No. 1), and throughout the war navigation on the Green was subjected to repeated Confederate attacks. Similar attacks were made on vessels traveling the Kentucky River, where the Commonwealth had another slackwater project in operation, and on other tributary streams. Because of the disruption of war, the locks and dams of the Kentucky state slackwater projects were not maintained, and by the end of hostilities navigation facilities had seriously deteriorated. This was to lead in the postwar era to the formation of private companies for the maintenance of the state projects and eventually to federal control and operation of the old state slackwater projects.¹⁰

Civil War Military Mission

Though waterborne commerce on the Ohio Valley waterways experienced an unprecedented growth during the war to meet the supply needs of Union armies, personnel of the Army Engineers did not conduct operations to improve navigation. Instead they were charged with the performance of various military missions,

consisting chiefly of the procurement and supply of equipment for the combat Engineers, the construction of temporary pontoon bridging for troop movement, the performance of topographic reconnaissance and mapping activities, and the development of extensive fortification systems to protect major military depots, important cities, and rail lines.

At the commencement of hostilities, the United States Army Engineers had only a single battalion of regular Engineer troops; and of the ninety-three Engineer officers in service in 1861 fifteen resigned to join their homes states in the Confederacy. A Confederate Engineer Corps, staffed principally by former United States Engineer officers, was created on March 6, 1861, but it also had limited personnel — ten officers and a company of enlisted men. The Engineers of both armies, who often operated in the vanguard of the armies on reconnaissance missions, suffered heavy casualties, and their number was further reduced by the assignment of experienced Engineer officers to field commands. Such Confederate officers as Robert E. Lee, P. G. T. Beauregard, and Joseph E. Johnston had been United States Engineers prior to the war, and thirty-three Union Generals, including such men as George Meade, Henry Halleck, John Pope, George B. McClellan, and James B. McPherson, had formerly served in the Engineer organization.¹¹

Because of the paucity of trained and experienced military engineers, most engineer troop units and their commanding officers were volunteers with prewar construction and engineering experience on civil works and railroad projects. Behind-the-lines combat support activities were performed, for the most part, by civilian assistant engineers with forces of hired labor under the general direction of a reg-

ular Engineer officer.

Engineer Supply and Procurement

No pontoon bridging equipment was available west of the Appalachians at the outset of war, and furnishing such equipment became a major responsibility of an Engineer supply depot — United States Engineer Agency, Armies of the West — at Cincinnati. But before this agency was established, pontoons were needed on the Lower Ohio. When General Ulysses S. Grant seized Paducah and Smithland at the junctures of the Tennessee and Cumberland rivers with the Ohio in 1861, he determined to construct a bridge across the Ohio to facilitate troop movement and communications. A fleet of thirteen steamboats and 120 coal barges descended from Cincinnati to Paducah, where General Grant's Engineers constructed the longest floating bridge of record.¹²

Just below Paducah (near the present site of Lock and Dam No. 52 and the Irvin Cobb Bridge), Engineers placed coal barges across the Ohio to Tug Island and from the island to the Kentucky bank. A twenty-foot-wide roadway was placed across the barges from bank to bank, with a movable section for passing river traffic and telegraph posts and wire to facilitate communications. The length of the bridge across the main channel was 3,960 feet, and, adding the width of the island and the bridge between it and the Kentucky bank, it totaled nearly a mile in length, a record still unsurpassed in 1975.¹³

Both Union and Confederate armies used wooden pontoons transported in specially constructed wagons during the early stages of the war. A number of "pontoon trains" — pontoons, large wagons, chess planks, stringers, and other equip-

ment — were furnished Union armies by the Engineer depot at Cincinnati. In the last years of war, Union Engineers adopted the canvas-covered, folding pontoon — simply a wooden boat frame over which a heavy canvas hull was stretched. They were light, could be transported in the standard Army supply wagon, and could be quickly assembled by men in the field. Colonel William E. Merrill, chief engineer of the Army of the Cumberland, redesigned the boat frames and added hinges to permit folding in early 1864. This made them even more mobile, and materials for this type of pontoon were procured and assembled by the Cincinnati Engineer depot for use in crossing the many rivers of Georgia and the Carolinas.¹⁴

Other Engineer equipment purchased, assembled, and supplied by the Cincinnati depot included such items as an eighty-wagon tool train loaded with saws, hammers, nails, ropes, and axes for the use of the "Pioneer Brigade" (First United States Veteran Volunteer Engineers) for road and bridge construction ahead of the Union army which moved from Nashville through Chattanooga into Georgia. In 1863 and 1864 the Cincinnati depot furnished a thousand carts, a thousand drays, two thousand sets of mule harness, portable steam saw mills, and immense quantities of lumber for use in fortifying Union supply depots at Nashville, Chattanooga, Louisville, Cincinnati, and elsewhere. The Cincinnati depot also furnished such miscellaneous items as stationary, mapping materials, instruments, and printing equipment for the topographic units performing mapping functions.¹⁵

Fortification Construction

The construction of fortifications at the



(From Harper's Weekly)

Pontoon Bridge at Paducah, Kentucky, 1861

front was ordinarily accomplished by infantry detachments under the supervision of Engineer officers, with the work requiring skilled labor performed by volunteer Engineer units. Behind-the-lines construction was commonly completed by hired and conscripted labor forces under the supervision of civilian assistant engineers who reported to the officer of Engineers in charge of a military department or division. Though Confederate Engineers fortified a few cities in Kentucky in the early phases of the war — notably at Bowling Green — the course of the war after 1862 limited their construction activities to the areas controlled by Confederate armies south of the Ohio Valley.

Some limited fortification construction was completed at Union staging areas, such as Cairo, Illinois; but major activities began when General Grant occupied Paducah and Smithland in September, 1861, and directed his Engineers to prepare defenses for both cities. At Smithland, two earthworks mounting a battery of three large cannon were built; and Paducah was surrounded by a two-mile defensive line of timber abatis and earthworks, with a central redoubt (Fort Anderson) housing a thousand-man garrison and cannon. These fortifications controlled approaches to the towns and navigation on the Cumberland, Tennessee, and Ohio rivers.

Louisville and Cincinnati were first fortified when Confederate forces commanded by General Braxton Bragg and General Edward Kirby Smith advanced into Kentucky and threatened the cities in the autumn of 1862. It appears that one of the major objectives of the Confederate campaign in Kentucky in 1862 was to seize the Louisville and Portland Canal, thereby severing Union logistics via the

Ohio River. One Confederate officer even suggested destroying the Louisville canal so completely that "future travelers would hardly know where it was."¹⁷

As Confederates approached Louisville, thousands of troops were assembled in the city, labor was conscripted, and General William Nelson ordered the construction of a hasty defensive line around the city and the placement of pontoon bridges across the Ohio to facilitate evacuation of the city and logistic support from the Indiana bank if a siege ensued. Two pontoon bridges, built of coal barges — one just below the present site of the Big Four Bridge and the other from Portland to New Albany — were laid down, but the Union Army of the Cumberland, commanded at the time by General Don Carlos Buell, won the race from Tennessee back to Louisville, met the Confederates at the Battle of Perryville, October 8, 1862, and prevented a Confederate assault on the Falls City.¹⁸

With the exception of sporadic raids by Confederate cavalry in force, such as those led by John H. Morgan and Nathan B. Forrest, the major military action of the war in the West was fought south of the Cumberland River after the battle of Perryville, but Union authorities were anxious that such cities as Louisville and Cincinnati, whose capture could be a serious blow to Union morale and destroy the logistic system, be placed in a defensible condition. Colonel James H. Simpson, in command of the Cincinnati Engineer Depot, was assigned responsibility for constructing fortifications around Louisville, Cincinnati, and other vulnerable points in the Ohio Valley. And, because officers of Engineers were rarely available for service at the rear of the armies, Colonel Simpson employed civilian assistant engineers to supervise fortification con-



Wooden pontoon under construction (in Kentucky). 1862. Copy of original drawing printed in *Harper's Weekly*, 1862.

struction.

Fortifications constructed during the early phases of the war were often "thrown up" — that is, built of timber and stone masonry with nearly vertical walls. After Engineers observed the effects of increased fire power on such structures, they began to design fortifications which were "dug in" — that is, constructed chiefly of earth and less vulnerable to enemy artillery. Most fortifications completed under the direction of Colonel Simpson in 1864 and 1865 were of the latter type of construction.

Colonel Simpson appointed John R. Gilliss, as assistant engineer in immediate charge of construction at Louisville, and a number of field supervisors, surveyors, and draftsmen. Surveying and drafting were largely the responsibility of George B. Nicholson. Because the assistant engineers thought the five-mile line of intrenchments completed in 1862 too near the city to provide adequate protection from artillery, they made no use of previous work and designed a new fortification system. The first work undertaken was Fort McPherson, commanding the approaches to the city via Shepherdsville Pike, Third Street Road, and the Louisville and Nashville Railroad. Fort McPherson, designed to serve as a citadel if an attack came before the entire system were completed, was an elaborate work large enough to protect a thousand-man garrison. Construction proceeded slowly, until General John B. Hood and a Confederate army marched north from Georgia in August, 1864. It was rumored that General Hood would move into the Ohio Valley, and thus draw General W. T. Sherman and the Union army out of Georgia to defend its logistic lines. The Union command determined, however, not to withdraw from Georgia and to leave the advancing Con-

federate army to Union troops assembling at Nashville under General George H. Thomas. It became imperative, therefore, that Louisville and other Ohio Valley cities be prepared for defense, should the Confederate army get past General Thomas and the troops at Nashville.¹⁹

General Hugh Ewing, Union commander at Louisville, directed that municipal authorities furnish laborers for fortifications, ordered the arrest of all "loafers found about gambling and other disreputable establishments" in the city for construction work, and also assigned military convicts to the work. Eleven forts were hastily constructed to cover the approaches to the city: Fort Elstner on the Brownsboro Pike; Fort Engle, commanding the bridge over Bear Grass Creek, the Frankfort railroad, and Shelbyville Road; Fort Saunders covering Shelbyville and Bardstown pikes; Fort Hill on Newburgh Road; Fort Horton on Shelby Street Road; Fort Philpot on the Nashville Pike; Fort St. Clair Morton, covering Salt River Road and Cane Run Road; Fort Karnasch at the intersection of Cane Run Road and Shippingport Road; Fort Clark to cover Lower Paddy's Run; Fort Southworth on Upper Paddy's Run; and Fort McPherson.²⁰

Each was a basic earth and timber structure surrounded by a ditch with a movable draw-bridge at the entrance to the fort, and each was furnished with an underground magazine to house 200 rounds of artillery shells. These eleven redoubts occupied the most commanding positions around the city, and were positioned to provide an interlocking cross-fire between them. A supply of intrenching tools was also collected and stored for emergency construction of additional batteries and infantry intrenchments between the fortifications. But General Hood and the Confederate army were stopped at the Battle

of Nashville in late 1864 and no Confederate force reached Louisville. The guns in the Louisville fortifications were probably never fired, except for salutes.²¹

Other works completed under the supervision of Colonel Simpson included artillery positions and barracks known as Fort Wolfe, for defense of a bridge across Salt River; Fort Boyle, an artillery redoubt and log blockhouse, and Fort Sands, an earthwork with a magazine, on Muldraughs Hill; artillery positions at Munfordsville on the Upper Green River; Forts Lytle and Smith on hills commanding Bowling Green; Fort Boone and New Fort Boone at Frankfort; Fort Robinson at Paris, Kentucky; Fort Clay and Fort Crittenden at Lexington; Fort Hutchinson at Mt. Sterling; Fort Williams at Glasgow; Fort Bishop at Louisa; and several forts at Camp Burnside on the Cumberland River. Around Cincinnati, Ohio, and the cross-river towns of Newport and Covington, twenty artillery positions were built, about nine miles of infantry intrenchments were completed, and Forts Mitchell, Wright, Burnside, and Whittlesey were constructed. In addition, under the direction of Major Miles D. McAlester and Colonel William E. Merrill, both Corps officers, about two hundred fortified timber blockhouses were constructed to defend railroad bridges in Kentucky and on the Louisville and Nashville Railroad and other rail lines transporting large amounts of supplies and reinforcements to Union armies at the front. The blockhouses were constructed to prevent Confederate raiding parties from burning bridges and disrupting Union logistics.²²

Most of these fortifications never saw action, but their existence was an effective deterrent against the surprise assaults by intrepid Confederate commands, which had so embarrassed Union operations and

disrupted supply activities during the early years of the war. Construction of uncompleted projects was halted on May 1, 1865, after the surrender of the Confederate army at Appomattox, but a few were garrisoned by troops during the turbulent years just after the war.

Close of the War

At the end of hostilities, military supply depots in the Ohio Valley, except Jeffersonville Quartermaster Depot at Jeffersonville, Indiana, were closed. The depot at Jeffersonville, established during the war, had procured clothing and other supplies in immense quantities for Union armies, and its operations continued for the supply of troops engaged in frontier Indian wars. Most surplus materials at other depots, including those on hand at the Cincinnati Engineer Depot, were moved to Jeffersonville for storage. Colonel James H. Simpson closed the Cincinnati depot and departed for the frontier where he conducted surveys for the transcontinental railroads then under construction; he took with him his Louisville assistant engineer, John R. Gilliss. Gilliss designed tunnels for the Central Pacific Railroad through the Rockies in 1866, and then returned to New York City where he died in 1870 while constructing one of the first pneumatic tunnels in the United States. George Nicholson, the draftsman at the Louisville fortification project, served as assistant on various Corps rivers and harbors project until 1873, then returned to Cincinnati as engineer on the Cincinnati Southern Railroad — he became Chief Engineer of the line in 1885.²³

Near the end of the war, troop movements on the Ohio River had increased. On January 11, 1865, the XXIII Army Corps was ordered from Tennessee to Virginia. Colonel Lewis B. Parsons, Chief

of Rail and River Transportation, assembled a fleet of forty steamboats at Paducah and moved 20,000 troops and a thousand head of horses and mules up the ice-filled Ohio to Cincinnati, where the journey continued by rail. In seventeen days, the XXIII Corps was transported 1400 miles, about half the distance by steamboat and half by rail, from camps on the Tennessee River to camps on the Potomac.²⁴

On May 15, 1865, Louisville was selected as the mustering-out center for troops from Midwestern and Western states; and on June 4 the headquarters of the Union Armies of the West was established at Louisville. During June, 96,796 troops and 8,896 animals left Washington for the Ohio Valley, via railroad to Parkersburg, West Virginia, where 70,000 took steamboats to Louisville and the remainder embarked for St. Louis and Cincinnati. The Troops boarded 92 steamboats at Parkersburg and descended the river in convoys of eight boats, to the sound of ovations and cannon salutes at every port city. Though the Ohio had less than three feet of water on many of its bars at the time, the voyage was made without loss of life at an average cost of \$3.40 per soldier. For several weeks Louisville was thronged with celebrating soldiers, and on July 4 General W. T. Sherman visited the city to conduct a final inspection of the Armies of the West. By mid-July the Armies of the West were disbanded, and the soldiers on their way home to resume their peace-time pursuits.²⁵

At least 143 steamboats, valued at nearly four million dollars, were lost in government service on the Ohio and Mississippi river systems during the war. And in fiscal year 1866, 262 steamboats were still in government service; but by the end of the year all had been sold. After 1861, the volume of waterborne commerce on the Ohio

had increased each year, and more tolls were collected at the Louisville and Portland Canal in 1866 than in any other year prior to 1872, when the enlarged locks were completed. The waterways of the Ohio and Mississippi valleys had contributed significantly to the success of the military efforts of the Union. And the work of western steamboatmen during the conflict was also an important element of the Union success. Perhaps Colonel Lewis B. Parsons, Chief of Union Rail and River Transportation best summarized this contribution in 1865:

It has often fallen to my lot to witness the cool bravery and acts of daring of this class of men in the passage of batteries or the sudden and unexpected attack of bands of guerillas while navigating our western rivers; and Generals Grant and Sherman, with many others, will bear witness that none have shown greater firmness and resolution in danger or more reckless daring and disregard of personal safety, and I doubt not many of their deeds will live in history. . . . It was by the services of such men that the government was enabled so rapidly to concentrate re-enforcements at Donelson and Shiloh; that with seven days' notice it was enabled to embark forty thousand men under Sherman in mid-winter for the movement against Vicksburg, and subsequently to precipitate the same force upon and capture the post of Arkansas. It was their courage that piloted our transports past the batteries of Island No. 10, Vicksburg, and numberless other places along our western waters; and all who have seen the unblanched cheek and steady arm by which the pilot at the wheel or the captain on the hurricane roof have discharged their duties in hours of danger cannot fail to acknowledge that they justly deserve a page in the history of the events of this war.²⁶

Revival of Federal Waterways Projects

The waterborne commerce generated by the war doubtless had a material influence on the renewed public interest in waterways improvement projects which developed in the postwar era; and there could be no doubt that improvement of

navigation would be beneficial, for between 1866 and 1870 over two thousand people perished in accidents on western rivers. The eclipse of the states' rights segment of the Democratic party in conjunction with the ascendance of the Republican party, which was firmly committed to a federal civil works program, had also opened the way to positive action on needed waterways projects. The constitutionality of federally funded and administered waterways projects was no longer seriously questioned, not even by Democratic Presidents, after the war. Rivers and harbors appropriation bills enacted by Congress in the postwar era were occasionally vetoed and were often criticized for their "pork barrel" provisions, but these objections were based on the expediency, not constitutionality, of appropriation.²⁷

The Rivers and Harbors Act of June 23, 1866, directed the Chief of Engineers to review all prewar waterways projects and plan additional projects of value. It also provided \$550,000 to reestablish the Office of Western River Improvements, build new floating plant, and renew channel clearance projects on the Mississippi, Missouri, Arkansas, and Ohio rivers. General Richard Delafield, Chief of Engineers, completed a quick review of prewar projects and reported to Congress that the benefits of some projects had been substantial, but after the work had been abandoned the quality of navigation had deteriorated and in very few instances had any permanent benefits been secured. He recommended annual appropriations by Congress as "indispensable to obtain the desired object."²⁸

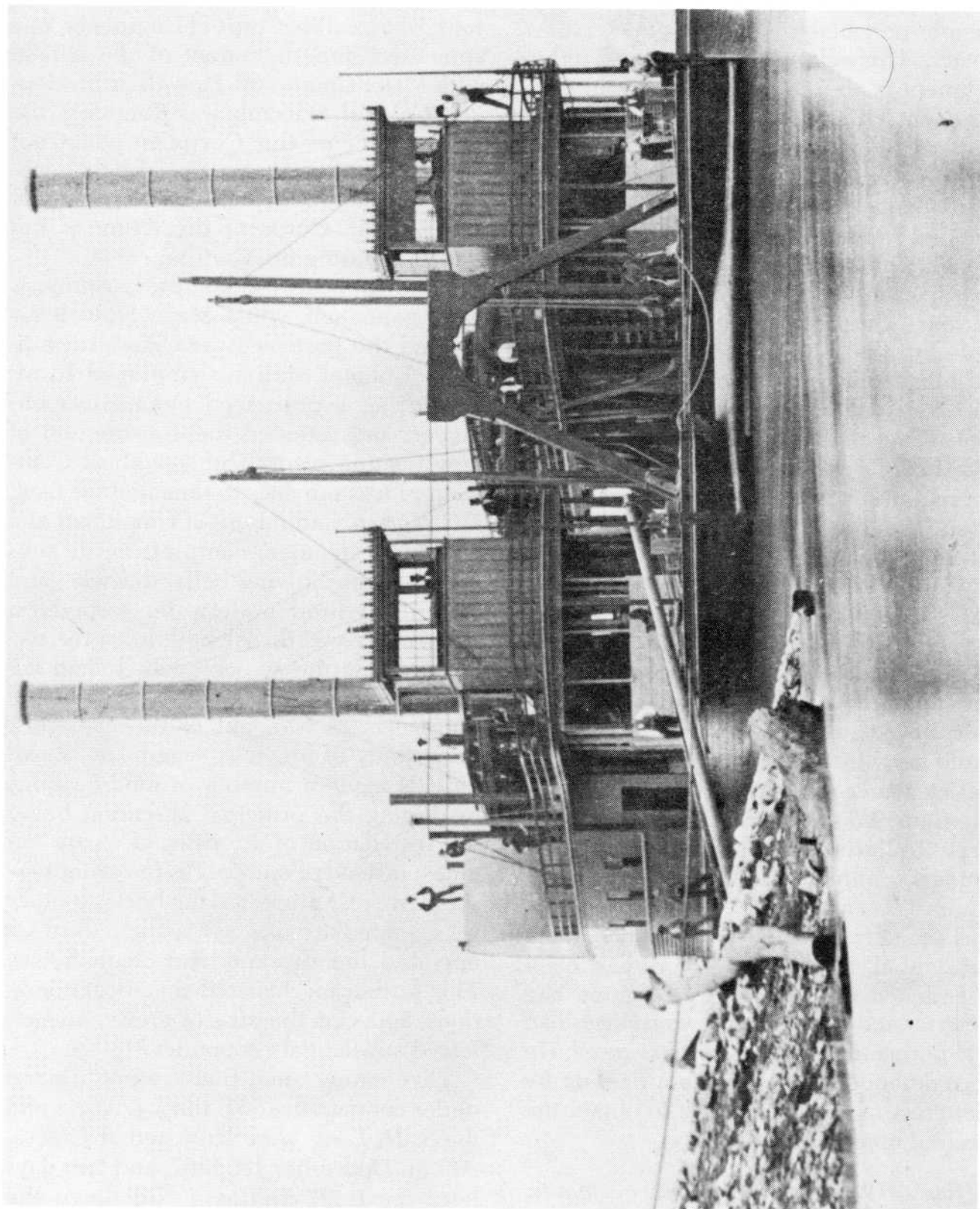
*Office of Western River Improvements,
1866-1870*

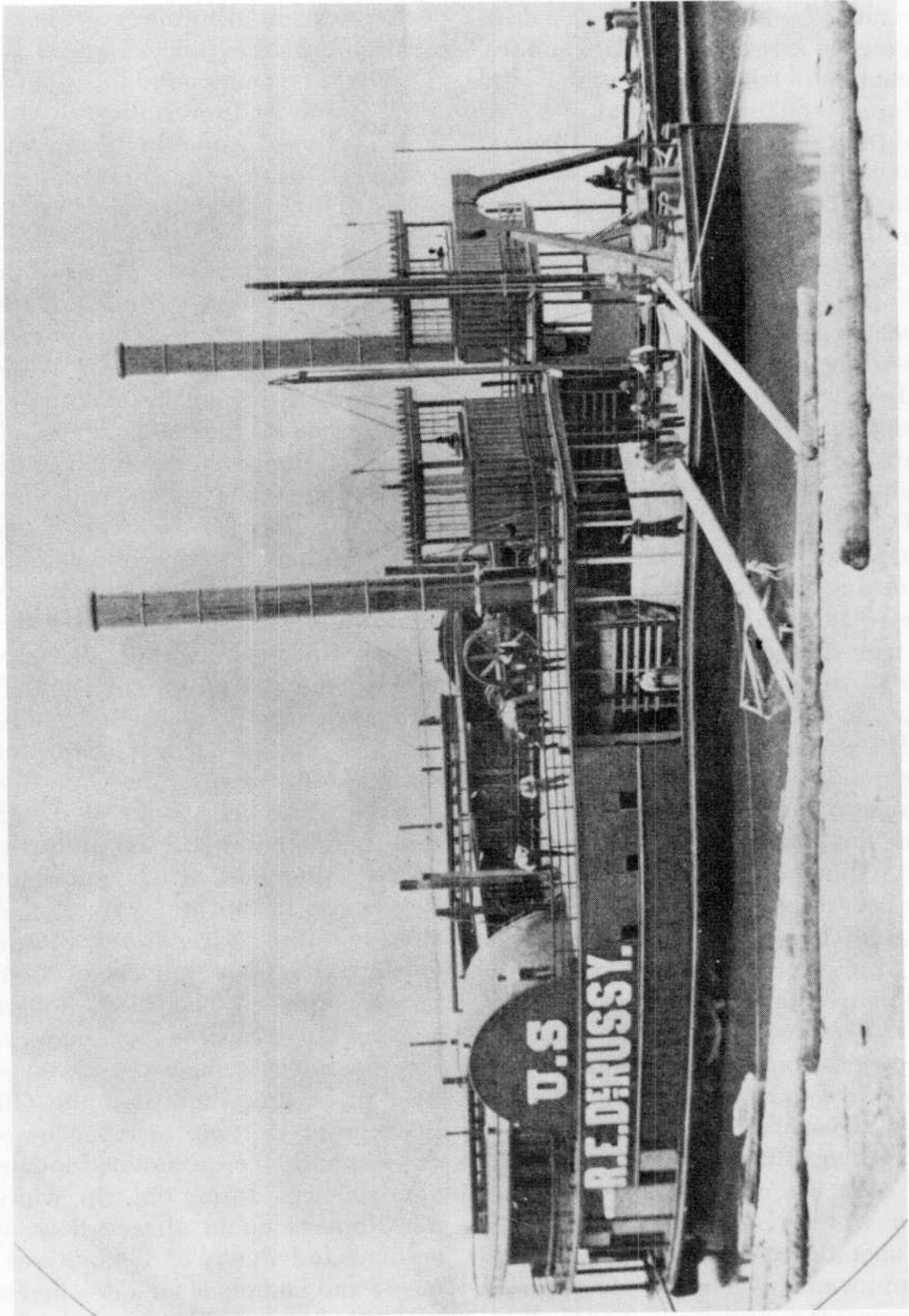
The Office of Western River Improve-

ments was reestablished, with offices at Cincinnati, on August 22, 1866. Colonel John N. Macomb, Corps of Engineers, was appointed Superintendent of the Office, with Major Charles W. Howell as his deputy. Colonel Macomb was doubtless the first officer of the Corps to construct facilities for the Air Force — he had constructed balloon-launching structures for the Balloon Corps of the Army of the Potomac during the Civil War.²⁹

The snag-boats used on prewar projects were gone, and, while Major Howell examined the postwar river channel conditions, Colonel Macomb employed E. M. Shield, an experienced mechanical engineer, and initiated the construction of new floating plant. The steamboat *Commodore* was purchased, renamed the *Gen. J. G. Totten*, and rebuilt at Cincinnati as a wrecking steamer, complete with submarine armor, diving bells, derricks, and electrically-fired underwater torpedoes. The *Totten* was dispatched down the rivers to blow the wrecks, which had accumulated during a decade of neglect and four years of war, out of the channels. After study of previous snag-boats, E. M. Shields made a number of modifications in design, the principal alteration being the installation of six pairs of steam engines, instead of one pair as in earlier vessels. One pair propelled the boats; another set operated the snag-saws; and a third set operated the capstans and chain hoists. This further mechanized snag-boat operations, reduced the size of crews, and effected substantial economies.³⁰

Three new snag-boats were placed under contract in 1867: the *J. J. Abert* and the *S. H. Long* were launched at Cincinnati on December 18, 1867, and two days later the *R. E. DeRussy* slid down the ways at New Albany. Macomb and Shields reverted to the double-hull,





(Office of the Chief of Engineers, Group 77, National Archives)

Two views of the snagboat R. E. De Russy

twin-boat design of Shreve, rather than the single-hull design of Long and Russell, because the boats were destined for service on the Lower Mississippi and the lower courses of tributary streams. Henry Clay Long, son of Colonel Long, inspected their design and reported favorably. The *DeRussy*, as an example, had two hulls, each 150 feet long by 25 feet abeam, and the hulls were spaced 12 feet apart, giving the boat an overall width of 62 feet. In 1869 the Cincinnati office added the snag-boat *S. Thayer* to the fleet and purchased the dredge *Octavia*.³¹

The fleet was constantly at work on the Mississippi and the lower sections of the Missouri, Arkansas, and Ohio rivers, except when repaired and remanned at Mound City and Carondelet (the two ports used for Union ironclad construction and repair during the war); and their operations were attended by the same hazards which had afflicted similar work before the war — the crews and fleet were frequently decimated by disease and accidents. The wrecking boat *J. G. Totten* sank at Chester, Illinois, in late 1867; and in 1868 so many men died of disease on, or deserted, the snag-boat *J. J. Abert* that the captain, William B. Dodson, was forced to run the boat to port at Cairo, and he also died just after bringing the *Abert* to anchor.³²

A separate office for the improvement of the Ohio River was established in 1867, and, except for occasional channel clearance on the Lower Ohio, the Office of Western River Improvement had no further responsibility for the Ohio River project. After the new Engineer floating plant for western rivers was completed and in operation, the Office of Western River Improvements transferred its offices from Cincinnati to St. Louis, effective July 12, 1870.³³

Ohio River Commerce, 1866

Because no Engineer officers were available at the time, General Richard Delafield recommended the appointment of William Milnor Roberts, whom he knew to be an “expert in the improvement of Rivers,” as superintendent of the survey of the Ohio River authorized in the Rivers and Harbors Act of 1866; and the Secretary of War appointed Roberts to the post on August 3, 1866. Milnor Roberts was, indeed, an expert waterways engineer. Originally hired by Canvass White as a rodman on the Pennsylvania canal system, Roberts had become assistant to Sylvester Welch on the portage railroad connecting the Pennsylvania canals with the Ohio River. He later served as chief engineer and consultant on a number of the earliest canals and railroads constructed in America, notably on the slack-water project on the Monongahela River which opened the Pittsburgh coal fields to development. It will be recalled that Roberts was one of the earliest advocates of a slack-water project for the Ohio River.³⁴

Roberts had been acquainted with Captain John Sanders and the prewar project on the Upper Ohio. He acquired the Sanders’ maps of the upper river, chartered the steamboat *Greenback* (owned by Commander John Rodgers of Civil War fame), employed Thomas P. Roberts, his son and also a capable civil engineer, and George Rowley, an experienced steamboat pilot, and examined the Ohio in September-October, 1866. Thomas P. Roberts and George Rowley updated the Sanders maps during the trip, while Milnor Roberts made observations of the volume and needs of Ohio River commerce and laid plans for a detailed survey and the resumption of open-channel projects.³⁵

Milnor Roberts reported in December, 1866, that at the next low-water season he would continue a detailed survey of the Ohio, beginning where Sanders ended in 1844, would enter into contracts for repair of old dikes and construction of new dikes, and reported the extent of waterborne commerce on the Ohio which would be benefited by renewed work. His report on each port on the Ohio was in considerable detail. At Louisville, for instance, he found 81 steamboats registered with aggregate cargo capacity of 34,079 tons. Between April, 1865, and April, 1866, steamboats landed at Louisville 3,731 times. The Falls City had a population of 125,000 in 1866, had 419 manufactories employing about 8,000 men, and produced goods valued at \$27,517,458 annually. Roberts commented that Louisville, "being the *entrepôt* of a splendid agricultural and commercial region, is destined to be always one of the commanding cities of the interior."³⁶

Roberts concluded the most important development in traffic on the Ohio River was:

The general substitution of fleets of barges for the former single steamers, or the plan of floating boxes. It is reasonable to believe that after a while a large proportion of the steamers engaged in freighting will be tow-boats, running in connection with barges. Some single steamers will of course still be useful in carrying on the local passenger and freight business between the numerous commercial points along the river . . . ; but the bulk of the freighting will probably be ultimately carried on by means of barges towed by steamers.³⁷

Barges were chiefly used in 1866 for transporting coal mined in the Upper Ohio Valley to Cincinnati, Louisville, Memphis, and New Orleans, though some salt, agricultural produce, and manufactured iron were also barged. The Ohio River coal trade had begun about 1814

when coal was sent from mines near Pittsburgh to foundries at Louisville. For about forty years, 1814-1854, coal was carried in coalboats — rectangular wooden vessels resembling flat-boats approximately 100 feet long by 20 feet wide and 6 feet deep. They transported up to 10,000 bushels (330 tons) of coal, were run in pairs, and steered by long sweeps, or oars. Coalboats ran only at high water of seven feet or more at Pittsburgh and were knocked apart and sold as lumber at their destination. They often wrecked on the unimproved rivers, with average losses from each coalboat fleet estimated at ten percent.³⁸

Steamboat operators experimented at an early date with attaching flat and keel-boats to steamboats, and they learned that the most effective method of moving such auxiliary craft was to push them ahead and at the sides of the steamer, guiding them with a "flanking" movement. Barges were first used on the Ohio on a large scale by coal transporters about 1854 between Pittsburgh and Louisville; eventually the practice developed of breaking tows at the "Pumpkin Patch" above the Falls of the Ohio, taking the barges in sections over the Falls, assembling larger tows at Sand Island on the lower side, and proceeding to New Orleans. Milnor Roberts reported that in 1844 two and a half million bushels of coal descended the Ohio in coalboats, and by 1866 ninety steamboats were pushing coal down river and returning empty barges, moving at least forty million bushels of coal annually. In just one week in 1866, seven steamboats arrived at New Orleans from the Ohio Valley with fifty-eight coal barges transporting 45,000 tons of coal worth \$325,000.³⁹

In the opinion of Mr. Roberts, continued growth of the Ohio River coal trade would, in itself, economically justify the

improvement of navigation on the Ohio by "radical" methods; that is, the construction of a lock and dam, slackwater, canalization project. Roberts initiated a detailed survey of the hydrographic and topographic features of the Ohio River in 1867, and in 1870, after intensive study of various engineering methods and their possible application to the Ohio, he recommended officially that the United States undertake the canalization of the river. His recommendation launched a project which, after many delays, was to be completed in 1929, and he thereby earned the sobriquet "Genius of the Ohio River Improvement."

Summary

A booming wartime economy in the Ohio Valley and military use of rivers for troop transport and supply stimulated commercial use of the Ohio and its tributaries which peaked in 1866. The increase in traffic was achieved in spite of prewar government neglect of much-needed navigation improvements and Confederate harrassments during the conflict. In the postwar era railroads gradually absorbed much of the passenger, light-freight, and short-haul business of the packets, but the development of the barge-towing system stimulated use of the waterways for transportation of bulk

commodities and foreshadowed the use made of the rivers in the twentieth century.

During the Civil War the primary mission of the Corps of Engineers was military support and construction, not navigation improvement. Engineer officers, assistant civilian engineers, and combat engineer units operated throughout the Ohio Valley and to the south, performing reconnaissance, fortification construction, and logistic support missions. Most of the major cities of Kentucky were protected by Engineer-constructed fortifications, but the Corps was not authorized to perform any improvements to benefit waterways navigation, the logistic backbone of the Union Armies of the West, on the Ohio and its tributaries.

The national political realignment effected during the course of the war, however, resulted in a renewed federal program of civil works in the postwar era. The Rivers and Harbors Act of 1866 was landmark legislation, which funded a renewed snag-removal project on the Ohio and other western rivers and authorized a comprehensive, detailed survey of navigation on the Ohio River. As supplemented by subsequent legislation, the survey of the Ohio River authorized in 1866 became the foundation for the Ohio River Canalization Project.